

Applicants traverse the rejection of claims 1-6 and 9 as obvious over Weber et al. US 2004/0097012 (“Weber”) and likewise claims 7 and 8 as obvious over Weber and further in view of Tsuji et al. U.S. Patent No. 6,106,222 (“Tjusi”).

Independent claim 1 specifies a method of separating elongated semiconductor strips from a wafer of semiconductor material, said method comprising the steps of providing a plurality of elongated semiconductor strips formed in a wafer in a substantially parallel manner with respect to each other, said wafer having a substantially planar surface and a thickness dimension at a right angle to the substantially planar surface and a frame portion at opposite ends of said semiconductor strips connecting said strips to said wafer, said semiconductor strips each having a width at least substantially equal to the wafer thickness and a thickness dimension of said strip less than said width, a face of at least one of elongated semiconductor strips lengthwise forming an edge of said wafer or being nearest adjacent said edge; applying vacuum to said elongated semiconductor strip forming said edge or being adjacent to said edge; and displacing said wafer and a source of said vacuum relative to each other a predetermined distance to separate said elongated semiconductor strip having vacuum applied to said elongated semiconductor strip from said wafer.

Weber does not disclose or suggest applying vacuum to an elongated semiconductor strip forming an edge or being adjacent to an edge and displacing the wafer and source of vacuum relative to each other a predetermined distance to separate the elongated semiconductor strip having vacuum applied to the elongated semiconductor strip from the wafer.

The action correctly notes that Weber teaches separating strips of a wafer using a dicing saw. Otherwise, referencing paragraph 28, the action incorrectly states that, in using a

dicing saw, Weber therefore teaches applying vacuum to an elongated semiconductor strip and displacing the wafer and source of vacuum relative to each other a predetermined distance to separate the elongated semiconductor strip. In fact, paragraph 28 makes no mention of a vacuum. Of note, this paragraph states that “Preferably, separation of the strips from the frame is carried out using a laser or dicing saw.” Therefore, this paragraph does not teach what is stated in the action. In fact, a word search of Weber finds the word “vacuum” used only once, at the end of paragraph 77, relating to vacuum evaporation.

Clearly a dicing saw is not a vacuum. To conclude that teaching use of a dicing saw necessarily teaches applying vacuum in the manner defined by claim 1 herein is not supported.

Applicant notes that a vacuum may be associated with a dicing saw. Such a vacuum is often used to hold wafers or tapered wafers to a chuck for dicing. Weber teaches the use of a dicing saw to separate silicone strips from wafers. While Weber does not teach the use of vacuum, there are several known approaches for the use of a dicing saw and vacuum to separate strips. None of these known approaches utilizes a vacuum in the manner defined by claim 1 herein.

A first known approach involves placing the wafer on a suitable vacuum chuck. Vacuum is applied to the strips formed in the wafer, the area of wafer without strips, or both. The dicing blade is used to cut through the wafer or the strips to separate the strips from the wafer. The vacuum is then reduced or removed, and the strips and the wafer are removed from the chuck. Separation is caused by the dicing saw.

A second known approach involves placing the wafer on a suitable vacuum chuck. Vacuum is applied to the strips formed in the wafer, the area of wafer without strips, or both. The dicing blade is used to cut partially through the wafer or the strips to weaken the connection between the strips and the wafer. The vacuum is reduced or removed, and then the strips and the wafer are removed from the chuck. The strips could then be broken from the wafer at the weakened connection to separate the strips from the wafer. This separation is not a result of the vacuum.

A third known approach applies a tape or sheet to the wafer surface with a suitable adhesive. The wafers with the tape or sheet are placed on a suitable vacuum chuck. Vacuum is applied to the strips, the wafer, the taped or sheeted surface or any combination of the above. The dicing blade is used to cut through the wafer or the strips to separate the strips from the wafer. The cutting may also cut the tape depending on the orientation of the tapes or the depth of the cut. The vacuum is be reduced or removed, and then the strips and the wafer and the tape or sheet are removed from the chuck. The tape or sheet could then be removed from the wafer and the strips. This separation is not a result of the vacuum.

A fourth known approach applies a tape or sheet to the wafer surface with a suitable adhesive. The wafers with the tape or sheet are placed on a suitable vacuum chuck. Vacuum is applied to the strips, the wafer, the taped or sheeted surface or any combination of the above. The dicing blade is used to cut partially through the wafer or the strips to weaken the connection between the strips and the wafer. The cutting may also cut the tape depending on the orientation of the tapes or the depth of the cut. The vacuum is then reduced or removed and then the strips and the wafer and the tape or sheet is removed from the chuck. The tape or sheet is

removed from the wafer and the strips and then the strips are broken at the weakened connection to separate the strips from the wafers (or vice versa - break then remove tape/sheet).

In Weber, the separation results from the dicing or breaking a weakened connection caused by dicing. Dicing does not teach the displacement of a vacuum source to separate the strip from the wafer. Weber does not teach or suggest the claimed invention. In fact, Weber is entirely silent on features explicitly defined in the claimed invention. The claimed invention involves the application of vacuum to the semiconductor strip and then the displacement of the vacuum source relative to the wafer to separate the strip from the wafer. None of the above four known approaches involve the displacement of the vacuum source relative to the wafer to separate the strip from the wafer. Thus, the use of dicing saws to separate strips from a wafer does not teach the displacement of the vacuum source to separate the silicon strip, nor is it obvious to one having ordinary skill in the art. This is not taught by Weber or elsewhere.

For the above reasons, claim 1 is not obvious.

Claims 2-6 and 9 depend from claim 1 and are allowable for the same reasons therefor.

Claim 2 further specifies the steps of at least reducing the vacuum applied to the separated, elongated semiconductor strip, and displacing the separated, elongated semiconductor strip and the source of vacuum relative to each other. The action states that using a dicing saw implicitly teaches reducing a vacuum. A dicing saw is not a vacuum. It is not apparently how teaching a dicing saw implicitly teaches anything with respect to vacuum reduction. Claim 2 is allowable for this reason as well.

Claim 3 specifies that the step of reducing the vacuum comprises terminating the vacuum. The action indicates that such a step is implicit in using a dicing saw. Again, there is no basis for any such statement. Claim 3 is allowable for this reason as well. Claim 4 specifies the step of moving the wafer so that the elongated semiconductor strip is in close proximity to the source of vacuum. No such step is implicit in the use of a dicing saw. Thus, the rejection is improper and the claim is allowable.

Claim 5 specifies the step of moving the source of vacuum relative to the wafer so that the source of vacuum is in close proximity to the elongated semiconductor strip. Again, such a step is not implicit based on use of a dicing saw. Claim 5 is allowable.

Claims 6 specifies that the steps are repeatedly performed to separate two or more of the plurality of the elongated semiconductor strips from the wafer. While Weber may teach that steps are repeatedly performed, it does not disclose or suggest that steps using a vacuum as recited in claim 1 are repeatedly performed. Claim 6 is allowable for this reason as well.

Claim 9 specifies that the wafer is a single crystal silicon or multicrystalline silicon. Claim 9 is allowable for the same reasons discussed relative to claim 1.

For the above reasons, claims 1 - 6 and 9 are allowable and withdrawal of the rejection is requested.

Claims 7 and 8 depend from claim 1. Claim 7 specifies that the source of vacuum has a body with at least one cavity formed therein for providing the vacuum. The cavity adjacent the elongated semiconductor strip is substantially the same in size as or smaller than a dimension of a face of the elongated semiconductor strip. Claim 8 specifies forming weak points in

portions of the wafer adjacent opposite ends of the elongated semiconductor strip to facilitate separation of the elongated semiconductor strip from the wafer.

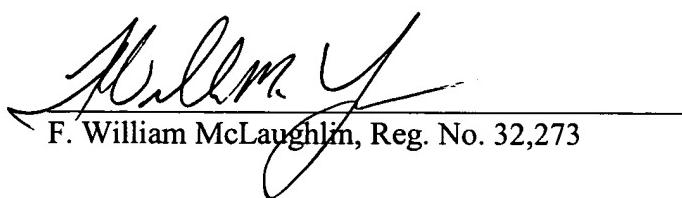
The deficiencies with respect to Weber and independent claim 1 are noted above. Tsuji does not disclose these deficiencies. Tsuji is cited for the use of a vacuum source with holes formed therein. It is not apparent how the use of the vacuum source of Tsuji would amend the process using the dicing saw in Weber. The action does not explain how the process would be modified. At most the combination would comprise one of the known approaches discussed above where a vacuum is used for holding a wafer to a chuck for a dicing. Claim 7 is allowable for this reason as well.

With respect to claim 8, Tsuji is cited for forming weak points. However, as Tsuji does not disclose the deficiencies noted above with respect to Weber, the combination does not result in the invention and claim 8 is allowable.

For the above reasons, claims 7 and 8 are allowable, and withdrawal of the rejection is requested.

Reconsideration of the application and allowance and passage to issue are requested.

Respectfully submitted,



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